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Applicant: Rheinische Kunsstoffwerke GmbH, D-67547 Worms, De
Agents: Rüdiger Zellentin et al.
Inventors: Rainer Pichl et al.
Prior art documents or citations:
DE-OS 43 11 867
DE-OS 40 16 348
DE-OS 37 39 962

Title in German of the object of the invention:
Folien mit textilem Griff

FOILS, HAVING TEXTILE TOUCH

Description

Object of the proposed patent application are a new kind of foils [films, sheets], having textile touch* [*Translator's note: also known as hand, feel, handle {in the UK}], which new-kind foils entirely or partially consist of a foamed polyethylene layer, or originate as a result of the stretching of this polyethylene layer.

For centuries, textiles, i.e. knitted or woven materials, are exclusively used for clothing purposes. Only as a result of the development of the modern plastic, it is now possible that plastic are now also sued for the said purpose. In doing so, it turned out as disadvantageous that plastic foils with their "cold" surface generate an unpleasant feeling upon the skin. Therefore, for a long time a plastic surface skin, having an inner layer of a textile woven fabric, is laminated for all-weather or waterproof clothing and similar purposes of application. The disadvantage of such laminates is the relatively great thickness of the material, which renders the entire material rigid, bulky and heavy.

Moreover, it is known that for use in products, related to personal hygiene, in particular diapers, plastic foils are provided with an overlay or pad of a nonwoven fabric [nonwoven fleece], in order to impart to the entire product a cloth-like appearance and corresponding textile-like hand or touch. On the one hand, these products have the advantage to have a fluffy ro fleecy, textile surface, pleasant to the skin, and, on the other hand, as a result of the selection of the carrier film material, they are waterproof or can be adjusted to be water-permeable in a controlled manner. Due to the requirement to the stability of the nonwoven layer, such laminates are also relatively thick (compare DE-OS 37 39 962 and DE-OS 40 16 348 and DE 43 11 867)> Further, the manufacturing of the nonwoven material [fleece], and the

rigid connection to the stabilizing carrier foil [substrate foil] additional require a considerable input or expenditure.

Therefore, the objective of the invention is to produce plastic foils, having a textile touch or hand, whose manufacturing is easier and more economically feasible, and which have a smaller thickness. As far as the case of application requires, such foils should be gas-permeable.

The set objective is achieved by way of the characteristic features of the principle patent, and by way of the characteristic features of the subclaims.

The manufacturing of foamed layers of plastic of most various kinds, among other things, from polyolefins, in their capacity as insulating and cushioning materials is known for a long time. For the manufacturing of those foamed materials* [*Translator's note: Also known as expanded (aerated or cellular) materials; cellular polymers] a plastic, which is still pasty, is either mechanically or chemically foamed [expanded] with the help of a relevant gas, spread into corresponding surface webs, and finally bonded, or the plastic is mixed with a chemical blowing agent* [*Translator's note: Also known as aerating, foaming, expanding agent], shaped into a film web [sheeting] as a result of extrusion by means of sheeting dice, rolling out in calanders or with the help of scattering techniques, and the blowing or aerating agent is decomposed in a foaming furnace while the temperature is elevated, and the preshaped foil is foamed. The foamed layers thus produced have a thickness of 0.50 to 50 mm, according to the

purpose of application. Due to the unicellular or closed-cell structure, such layers are water-impermeable, and , generally speaking, due to the layer thickness are also water-vapor impermeable (compare DE-OS 195 48 681 as well as the references cited therein).

In accordance with the invention, thin polyoelfin foils of a mixture of polyethylene and polypropylene, having a percentage of polyethylene from 50 to 100%, which contain 0.01 to 10%, preferably 0.50 to 3% blowing agent, and up to 80%, preferably up to 50%, other conventional supplementary or auxiliary agents, are formed into foils within the framework of an extrusion method, and, concurrently, are foamed up. For the manufacturing of particularly thin foils, extrusion blow-molding methods are especially advantageous. Laminate of foamed and non-foamed foils are produced by means of co-extrusion. The monofoils, which now consist of only a single foamed layer,can be made as having a thickness of 20 to 200 μm. For stabilization reasons, dimensions of the layer thickness from 50 to 200 μm are preferred. As a result of laminating-in of a carrier or substrate foil or coextruding with a carrier or substrate foil, which usually has a layer thickness of 10 to 50 μm, preferably 15 to 25 μm, unilaterally or bilaterally foamed layers can be mounted, which - after having been foamed - have only a thickness of still 5 to 50 μm, preferably of about 15 to 25 μm, so that the entire thickness of the composite material can constitute 50 μm.

. As a result of a joint use of fillers (delust[e]ring agents) such as chalk (calcium carboante), talcum powder* [*Translator's note: Also known as pulverized soapstone, Venetian or French chalk], barium sulfate, aluminum oxide, silica gel [silicic-acid gel], etc., the layers thus generated can additionally posses a lusterless surface. Addition of conventional auxiliary materials such as stabilizers, antioxidants, cross-linking agents, etc., provide an opportunity in a way, known in the abstract, to adjust the properties of the generated foils to the desired purpose of application.

By adding larger amounts of fillers, e.g., 30 to 80%, the foils can become gas-permeable, i.e. , e.g, they can allow the passage of water vapor, such as it is formed when a person sweats, but retain liquid water.

The foils, in accordance with the invention, are soft and pliable, and posses - due to their fine-celled foam structure of the surface - a textile hand [touch] so that they can be worn on the skin, without causing a feeling of stickiness or cold, typical for smooth foils. Preferred are foils in accordance with the invention for products of personal hygiene, e.g., for diaper laminations, diaper pants, panties' paddings or sanitary napkins. Moreover, the products may also advantageously be used for linen, in particular bed sheets, or for rain-proof clothing.

When the foils - in particular the composite foils, which are generated as a result of coextrusion - are stretched in cold state in a direction, which is transverse to [the direction of]

the manufacturing, by a factor of 1.2 to 3 : 1, preferably 2 : 1, a crimped or crinkled surface structure is achieved (crepe effect [crimp effect], which reinforces the pronounced textile character. In doing so, the source foils should have a correspondingly greater thickness.

Polyethylenes of lower density, in particular LDPE and LLDPE** types [**Translator's note: LDPE = low-density polyethylene; LLDPE = linear low-density polyethylene] can be used, alone or in mixture, whereby for the increase of the strength of the foil and for modification of the foils' properties, there can be added polypropylene in an amount of up to 50% of the entire mixture. The extrusion of those plastics is usually carried out in a temperature range from 150 to 210° C, as usually used for PE-foil-extrusion.

In its capacity as blowing agent* [*Translator's note: Also known as aerating (foaming, expanding) agent or gas-developing agent (propellant)], there is preferably used azodicarbonamide, which decomposes at temperatures, starting from about 130° C. As a result of a pressure of about 20 bar, with the help of which the mass is fed to the extrusion nozzle, a premature gas evolution or outgassing is prevented, and a uniform distribution over the plastic mass is achieved. In such a way, the production of a fine-celled foam is attained, and, therewith, a uniform foaming of the thin layers in accordance with the invention, The maximal concentration of blowing agent constitutes 10 % of the

mixture. The density, which is thus generated, is 0.1, preferably 0.3 to 0.8 g/cm^3.

Example 1

Manufacturing of a mono-foamed foil

Equipment: Controlled mono-blown film extruder, having 30 D-barrier endless screw

Formulation: 68% LDPE
30% LLDPE
2% blowing agent

Temperature of extrusion: 180-200° C
Mass temperature: 230° C
Thickness: 35μm

Foil properties (undrawn [not stretched or unstrained], 35 μm)
Breaking strength, transverse (N/inch) : 6
Elongation at rupture, transverse (%) : 180
Impact (mm) 350

Example 2

Manufacturing of a co-extruded, unilaterally coated carrier [substrate] foil

Equipment: 3-layer blown film extrusion installation, having 30 D barrier endless screw

Structure:	A	B and C
	Foam layer	Carrier [Substrate} Layer
Raw Materials:	67% LDPE 30% chalk batch (70%) 3% blowing agent	50% LDPE 50% LLDPE
Extrusion t°C :	150 ° C	180° C

Foil Properties (unstretched, 50μm)
Breaking strength, transverse (N/inch): 14
Breaking elongation, transverse (%) : 450
Impact (mm): : 800
Glance: 17

Patent Claims:

1. Foils, having textile hand [touch], consisting of a foamed layer or a carrier [substrate] foil, laminated on one or on both sides with a foamed layer, **characterized in that** the foamed layer consists of

a) a mixture of LDPE-polyethylene and/or LLDPE-polyethylene and/or polypropylene,

b) a blowing agent of 0.5 to 10% as well as

c) up to 80% of delustering agent and up to 10% of other conventional auxiliary materials,

d) the carrier foil consists of the components a) and c)

e) the foil is made within the framework of the extrusion method or co-extrusion method, and

f) the foamed layer has a thickness of 5 to 200 μm

g) the carrier foil has a thickness of 10 to 100 μm.

2. Foil as claimed in claim 1, characterized in that the blowing agent, b), constitutes 0.50 to 5.00 %

3. Foil as claimed in claim 1 or 2, characterized in that the entire thickness of the composite foils is less than 100 μm, while in the case of monofoils, it is less than 200 μm.

4. Foil as claimed in claims 1 thru 3, characterized in that the foil contains 3 to 5% of auxiliary materials.

5. Foil as claimed in claims 1 thru 4, characterized in that foamed layer contains 50 to 80% fillers, and is gas-permeable.

6. Foil as claimed in claims 1 thru 5, characterized in that

the filler is an inorganic delustering material, preferably chalk [calcium carbonate], talcum powder, aluminum oxide or silicic-acid gel.

7. Foil as claimed in claim 1 thru 6, characterized in that the foil is stretched in a cold state in the transverse direction, and the upper surface is crimped or crinkled.

8. Method for the manufacturing of foils in accordance with one of the claims 1 thru 7, characterized in that the mixture or mixtures are extruded, resp. co-extruded, at a temperature of 150 to 210° C by means of extrusion-blow molding.

9. Method for the manufacturing of foils in accordance with one of the claims 1 thru 7, characterized in that the foils are stretched in cold state in the transverse direction, until a crimped foil structure is produced.

10. Method as claimed in claim 9, characterized in that the stretching [drawing or tensioning] takes place in a ratio of 0.2 to 2 : 1, preferably 1 : 1.

11. Use of the foils as claimed in one of the claims 1 thru 7, for the manufacturing of products of personal hygiene.

12. use as claimed in claim 8 for the manufacturing of diaper pants, diapers' laminations, panties' paddings and sanitary napkins.

USDoC/USPTO/STIC/Translations Branch
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USPTO Translator from GERMAN & Germanic languages
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